CLAIMS

1. (currently amended) A multi-services access system ~~(e.g., 205 in Fig. 2)~~ for a telecommunication network, comprising:

(a) a packet-mode card ~~(e.g., 209)~~ capable of being coupled to one or more local derived-signal customer premises equipment (CPE) units ~~(e.g., 131)~~ to (1) receive upstream packetized data signals and upstream packetized derived voice signals from the one or more local packet-mode CPE units and (2) transmit downstream packetized data signals and downstream packetized derived voice signals to the one or more local packet-mode CPE units;

(b) a packet interface ~~(e.g., 211)~~ capable of being coupled to a packet-switched network ~~(e.g., 119)~~ to (1) transmit upstream packetized data signals and downstream packetized derived voice signals to the packet-switched network and (2) receive downstream packetized data signals and upstream packetized derived voice signals from the packet-switched network;

(c) a circuit interface ~~(e.g., 217)~~ capable of being coupled to a circuit-switched network ~~(e.g., 125)~~ to (1) transmit upstream digital streams to the circuit-switched network and (2) receive downstream digital streams from the circuit-switched network;

(d) a controller ~~(e.g., 215)~~ coupled to the circuit interface; and

(e) a derived-signal server ~~(e.g., 219)~~ coupled to the packet-mode card, the packet interface, and the controller, wherein:

at least one of the packet-mode card and the packet interface is capable of distinguishing packetized data signals from packetized derived voice signals;

the packet-mode card forwards each received upstream packetized data signal to the packet interface for transmission to the packet-switched network;

the packet interface forwards each received downstream packetized data signal destined for a local packet-mode CPE unit to the packet-mode card for transmission to the local packet-mode CPE unit;

the packet-mode card and the packet interface both forward each corresponding received upstream packetized derived voice signal to the derived-signal server, which converts the upstream packetized derived voice signal into an upstream digital stream and forwards the upstream digital stream to the controller, which forwards the upstream digital stream to the circuit interface, which transmits the upstream digital stream to the circuit-switched network; and

the circuit interface forwards each received downstream digital stream to the controller, wherein:

if the downstream digital stream is destined for a local packet-mode CPE unit, then the controller forwards the downstream digital stream to the derived-signal server, the derived-signal server converts the downstream digital stream into a downstream packetized derived voice signal and forwards the downstream packetized derived voice signal to the packet-mode card, which transmits the downstream packetized derived voice signal to the local packet-mode CPE unit; and

if the downstream digital stream is destined for a remote packet-mode CPE unit ~~(e.g., 143)~~, then the controller forwards the downstream digital stream to the derived-signal server, the derived-signal server converts the downstream digital stream into a downstream packetized derived voice signal and forwards the downstream packetized derived voice signal to the packet interface, which transmits the downstream packetized derived voice signal to the packet-switched network for routing to the remote packet-mode CPE unit.

2. (currently amended) The ~~invention~~ multi-services access system of claim 1, wherein the access system does not have individual dedicated resources for each local packet-mode CPE unit.

3. (currently amended) The ~~invention~~ multi-services access system of claim 1, wherein the access system dynamically allocates, in real time, system resources for each local packet-mode CPE unit.

4. (currently amended) The ~~invention~~ multi-services access system of claim 1, further comprising a circuit-mode card ~~(e.g., 213)~~ coupled to the controller and capable of being coupled to one or more circuit-mode CPE units ~~(e.g., 121)~~ to (1) receive upstream circuit-mode signals from the one or more circuit-mode CPE units and (2) transmit downstream circuit-mode signals to the one or more circuit-mode CPE units, wherein:

the circuit-mode card converts each upstream circuit-mode signal into an upstream digital stream and forwards the upstream digital stream to the controller, which forwards the upstream digital stream to the circuit interface, which transmits the upstream digital stream to the circuit-switched network; and

if a downstream digital stream received by the controller from the circuit interface is destined for a circuit-mode CPE unit, then the controller forwards the downstream digital stream to the circuit-mode card, which converts the downstream digital stream into a downstream circuit-mode signal and transmits the downstream circuit-mode signal to the circuit-mode CPE unit.

5. (currently amended) The ~~invention~~ multi-services access system of claim 4, wherein the circuit-mode card is further coupled to the packet-mode card, wherein the packet-mode card is capable of being coupled to one or more combined circuit/packet-mode CPE units ~~(e.g., 107)~~ to (1) receive upstream combined circuit/packet-mode signals from the one or more combined circuit/packet-mode CPE units and (2) transmit downstream combined circuit/packet-mode signals to the one or more combined circuit/packet-mode CPE units, wherein:

the packet-mode card separates each upstream combined circuit/packet-mode signal received from a combined circuit/packet-mode CPE unit into an upstream packetized data signal and an upstream circuit-mode signal, wherein:

the packet-mode card forwards the upstream packetized data signal to the packet interface, which transmits the upstream packetized data signal to the packet-switched network; and

the packet-mode card forwards the upstream circuit-mode signal to the circuit-mode card, which converts the upstream circuit-mode signal into an upstream digital stream and forwards the upstream digital stream to the controller, which forwards the upstream digital stream to the circuit interface, which transmits the upstream digital stream to the circuit-switched network;

if a downstream packetized data signal received by the packet interface from the packet-switched network is destined for a combined circuit/packet-mode CPE unit, then the packet interface forwards the downstream packetized data signal to the packet-mode card, which combines the downstream packetized data signal with any corresponding downstream circuit-mode signal and transmits the resulting downstream combined circuit/packet-mode signal to the combined circuit/packet-mode CPE unit; and

if a downstream digital stream received by the controller from the circuit interface is destined for a combined circuit/packet-mode CPE unit, then the controller forwards the downstream digital stream to the circuit-mode card, which converts the downstream digital stream into a downstream circuit-mode signal and transmits the downstream circuit-mode signal to the packet-mode card, which combines the downstream circuit-mode signal with any corresponding downstream packetized data signal and transmits the resulting downstream combined circuit/packet-mode signal to the combined circuit/packet-mode CPE unit.

6. (currently amended) The ~~invention~~ multi-services access system of claim 5, wherein:

the multi-services access system is a multi-services digital loop carrier (DLC) system;

the packet-mode card is digital subscriber line (DSL) line card;

the circuit-mode card is a voice card;

the one or more circuit-mode CPE units are telephones;

the one or more local and remote packet-mode CPE units and the one or more combined circuit/packet CPE units are DSL CPE units;

~~the packetized-derived signals comprise packetized-derived voice signals;~~

the DLC system does not have individual dedicated resources for each local packet-mode CPE unit; and

the DLC system dynamically allocates, in real time, system resources for each local packet-mode CPE unit.

7. (currently amended) A method for processing signals in a multi-services access system for a telecommunication network, the access system capable of being coupled directly to one or more local packet-mode CPE units, a packet-switched network, and a circuit-switched network, comprising the steps of:

(a1) distinguishing packetized derived voice signals from packetized data signals;

(a2) transmitting each upstream packetized data signal received from a local packet-mode CPE unit to the packet-switched network;

(b) if a downstream packetized data signal received from the packet-switched network is destined for a local packet-mode CPE unit, then transmitting the downstream packetized data signal to the local packet-mode CPE unit;

(c) converting each upstream packetized derived voice signal received from either a local packet-mode CPE unit or the packet-switched network into an upstream digital stream and transmitting the upstream digital stream to the circuit-switched network;

(d) if a downstream digital stream received from the circuit-switched network is destined for a local packet-mode CPE unit, then converting the downstream digital stream into a downstream packetized derived voice signal and transmitting the downstream packetized derived voice signal to the local packet-mode CPE unit; and

(e) if a downstream digital stream received from the circuit-switched network is destined for a remote packet-mode CPE unit, then converting the downstream digital stream into a downstream packetized derived voice signal and transmitting the downstream packetized derived voice signal to the packet-switched network for routing to the remote packet-mode CPE unit.

8. (currently amended) The ~~invention~~ method of claim 7, wherein the access system does not have individual dedicated resources for each local packet-mode CPE unit.

9. (currently amended) The ~~invention~~ method of claim 7, wherein the access system dynamically allocates, in real time, system resources for each local packet-mode CPE unit.

10. (currently amended) The ~~invention~~ method of claim 7, wherein the access system is further capable of being coupled to one or more circuit-mode CPE units and further comprising the steps of:

(f) converting each upstream circuit-mode signal received from a circuit-mode CPE unit into an upstream digital stream and transmitting the upstream digital stream to the circuit-switched network; and

(g) if a downstream digital stream received from the circuit interface is destined for a circuit-mode CPE unit, then converting the downstream digital stream into a downstream circuit-mode signal and transmitting the downstream circuit-mode signal to the circuit-mode CPE unit.

11. (currently amended) The ~~invention~~ method of claim 10, wherein the access system is further capable of being coupled to one or more combined circuit/packet-mode CPE units and further comprising the steps of:

(h) separating each upstream combined circuit/packet-mode signal received from a combined circuit/packet-mode CPE unit into an upstream packetized data signal and an upstream circuit-mode signal;

(i) transmitting the upstream packetized data signal to the packet-switched network;

(j) converting the upstream circuit-mode signal into an upstream digital stream and transmitting the upstream digital stream to the circuit-switched network;

(k) if a downstream packetized data signal received from the packet-switched network is destined for a combined circuit/packet-mode CPE unit, then combining the downstream packetized data signal with any corresponding downstream circuit-mode signal and transmitting the resulting downstream combined circuit/packet-mode signal to the combined circuit/packet-mode CPE unit; and

(l) if a downstream digital stream received from the circuit-switched network is destined for a combined circuit/packet-mode CPE unit, then converting the downstream digital stream into a downstream circuit-mode signal, combining the downstream circuit-mode signal with any corresponding downstream packetized data signal, and transmitting the resulting downstream combined circuit/packet-mode signal to the combined circuit/packet-mode CPE unit.

12. (currently amended) The ~~invention~~ method of claim 11, wherein:

the multi-services access system is a multi-services digital loop carrier (DLC) system;

the one or more circuit-mode CPE units are telephones;

the one or more local and remote packet-mode CPE units and the one or more combined circuit/packet CPE units are DSL CPE units;

~~the packetized derived signals comprise packetized derived voice signals;~~

the DLC system does not have individual dedicated resources for each local packet-mode CPE unit; and

the DLC system dynamically allocates, in real time, system resources for each local packet-mode CPE unit.

13. (currently amended) A method for processing signals in a multi-services access system for a telecommunication network, comprising the steps of:

(a) receiving packetized data signals and packetized derived voice signals from a packet-mode ~~CPE~~ customer premises equipment (CPE) unit;

(b) determining whether each packet received from the packet-mode CPE unit is a data packet or a derived voice packet;

(c) transmitting each data packet from the packet-mode CPE unit directly to a packet-switched network for packet-based switching; and

(d) converting each derived voice packet from the packet-mode CPE unit into a digital stream and transmitting the digital stream directly to a circuit-switched network for circuit-based switching.

14. (currently amended) The ~~invention~~ method of claim 13, wherein the access system does not have individual dedicated resources for the packet-mode CPE unit.

15. (currently amended) The ~~invention~~ method of claim 13, wherein the access system dynamically allocates, in real time, system resources for the packet-mode CPE unit.

16. (currently amended) The ~~invention~~ method of claim 13, further comprising the steps of:

(e) receiving an incoming digital stream directly from the circuit-switched network;

(f) converting the incoming digital stream into an outgoing packetized derived voice signal; and

(g) transmitting the outgoing packetized derived voice signal to the packet-mode CPE unit.

17. (currently amended) The ~~invention~~ method of claim 13, wherein the access system enables the packet-mode CPE unit to transmit and receive packetized derived voice signals to and from

the circuit-switched network without using any packet-switched network and without using any external gateway interconnecting the circuit-switched network and any packet-switched network.

18. (currently amended) The ~~invention~~ method of claim 13, wherein:
the multi-services access system is a multi-services digital loop carrier (DLC) system; and
the packet-mode CPE unit is a DSL CPE unit; ~~and~~
~~the packetized derived signals comprise packetized derived voice signals~~.

19. (new) A multi-services access system for a telecommunication network, comprising:

(a) a packet-mode card capable of being coupled to one or more local derived-signal customer premises equipment (CPE) units to (1) receive upstream packetized data signals and upstream packetized derived signals from the one or more local packet-mode CPE units and (2) transmit downstream packetized data signals and downstream packetized derived signals to the one or more local packet-mode CPE units;

(b) a packet interface capable of being coupled to a packet-switched network to (1) transmit upstream packetized data signals and downstream packetized derived signals to the packet-switched network and (2) receive downstream packetized data signals and upstream packetized derived signals from the packet-switched network;

(c) a circuit interface capable of being coupled to a circuit-switched network to (1) transmit upstream digital streams to the circuit-switched network and (2) receive downstream digital streams from the circuit-switched network;

(d) a controller coupled to the circuit interface; and

(e) a derived-signal server coupled to the packet-mode card, the packet interface, and the controller, wherein:

the packet-mode card forwards each received upstream packetized data signal to the packet interface for transmission to the packet-switched network;

the packet interface forwards each received downstream packetized data signal destined for a local packet-mode CPE unit to the packet-mode card for transmission to the local packet-mode CPE unit;

the packet-mode card and the packet interface both forward each corresponding received upstream packetized derived signal to the derived-signal server, which converts the upstream packetized derived signal into an upstream digital stream and forwards the upstream digital stream to the controller, which forwards the upstream digital stream to the circuit interface, which transmits the upstream digital stream to the circuit-switched network;

the circuit interface forwards each received downstream digital stream to the controller, wherein:

if the downstream digital stream is destined for a local packet-mode CPE unit, then the controller forwards the downstream digital stream to the derived-signal server, the derived-signal server converts the downstream digital stream into a downstream packetized derived signal and forwards the downstream packetized derived signal to the packet-mode card, which transmits the downstream packetized derived signal to the local packet-mode CPE unit; and

if the downstream digital stream is destined for a remote packet-mode CPE unit, then the controller forwards the downstream digital stream to the derived-signal server, the derived-signal server converts the downstream digital stream into a downstream packetized derived signal and forwards the downstream packetized derived signal to the packet interface, which transmits the downstream packetized derived signal to the packet-switched network for routing to the remote packet-mode CPE unit;

further comprising a circuit-mode card coupled to the controller and capable of being coupled to one or more circuit-mode CPE units to (1) receive upstream circuit-mode signals from the one or more circuit-mode CPE units and (2) transmit downstream circuit-mode signals to the one or more circuit-mode CPE units, wherein:

the circuit-mode card converts each upstream circuit-mode signal into an upstream digital stream and forwards the upstream digital stream to the controller, which forwards the upstream digital stream to the circuit interface, which transmits the upstream digital stream to the circuit-switched network; and

if a downstream digital stream received by the controller from the circuit interface is destined for a circuit-mode CPE unit, then the controller forwards the downstream digital stream to the circuit-mode card, which converts the downstream digital stream into a downstream circuit-mode signal and transmits the downstream circuit-mode signal to the circuit-mode CPE unit;

the circuit-mode card is further coupled to the packet-mode card, wherein the packet-mode card is capable of being coupled to one or more combined circuit/packet-mode CPE units to (1) receive upstream combined circuit/packet-mode signals from the one or more combined circuit/packet-mode CPE units and (2) transmit downstream combined circuit/packet-mode signals to the one or more combined circuit/packet-mode CPE units, wherein:

the packet-mode card separates each upstream combined circuit/packet-mode signal received from a combined circuit/packet-mode CPE unit into an upstream packetized data signal and an upstream circuit-mode signal, wherein:

the packet-mode card forwards the upstream packetized data signal to the packet interface, which transmits the upstream packetized data signal to the packet-switched network; and

the packet-mode card forwards the upstream circuit-mode signal to the circuit-mode card, which converts the upstream circuit-mode signal into an upstream digital stream and forwards the upstream digital stream to the controller, which forwards the upstream digital stream to the circuit interface, which transmits the upstream digital stream to the circuit-switched network;

if a downstream packetized data signal received by the packet interface from the packet-switched network is destined for a combined circuit/packet-mode CPE unit, then the packet interface forwards the downstream packetized data signal to the packet-mode card, which combines the downstream packetized data signal with any corresponding downstream circuit-mode signal and transmits the resulting downstream combined circuit/packet-mode signal to the combined circuit/packet-mode CPE unit; and

if a downstream digital stream received by the controller from the circuit interface is destined for a combined circuit/packet-mode CPE unit, then the controller forwards the downstream digital stream to the circuit-mode card, which converts the downstream digital stream into a downstream circuit-mode signal and transmits the downstream circuit-mode signal to the packet-mode card, which combines the downstream circuit-mode signal with any corresponding downstream packetized data signal and transmits the resulting downstream combined circuit/packet-mode signal to the combined circuit/packet-mode CPE unit.

20. (new) The multi-services access system of claim 19, wherein the access system does not have individual dedicated resources for each local packet-mode CPE unit.

21. (new) The multi-services access system of claim 19, wherein the access system dynamically allocates, in real time, system resources for each local packet-mode CPE unit.

22. (new) The multi-services access system of claim 19, wherein:

the multi-services access system is a multi-services digital loop carrier (DLC) system;

the packet-mode card is digital subscriber line (DSL) line card;

the circuit-mode card is a voice card;

the one or more circuit-mode CPE units are telephones;

the one or more local and remote packet-mode CPE units and the one or more combined circuit/packet CPE units are DSL CPE units;

the packetized derived signals comprise packetized derived voice signals;

the DLC system does not have individual dedicated resources for each local packet-mode CPE unit; and

the DLC system dynamically allocates, in real time, system resources for each local packet-mode CPE unit.

23. (new) A method for processing signals in a multi-services access system for a telecommunication network, the access system capable of being coupled directly to one or more local packet-mode CPE units, a packet-switched network, and a circuit-switched network, comprising the steps of:

(a) transmitting each upstream packetized data signal received from a local packet-mode CPE unit to the packet-switched network;

(b) if a downstream packetized data signal received from the packet-switched network is destined for a local packet-mode CPE unit, then transmitting the downstream packetized data signal to the local packet-mode CPE unit;

(c) converting each upstream packetized derived signal received from either a local packet-mode CPE unit or the packet-switched network into an upstream digital stream and transmitting the upstream digital stream to the circuit-switched network;

(d) if a downstream digital stream received from the circuit-switched network is destined for a local packet-mode CPE unit, then converting the downstream digital stream into a downstream packetized derived signal and transmitting the downstream packetized derived signal to the local packet-mode CPE unit; and

(e) if a downstream digital stream received from the circuit-switched network is destined for a remote packet-mode CPE unit, then converting the downstream digital stream into a downstream packetized derived signal and transmitting the downstream packetized derived signal to the packet-switched network for routing to the remote packet-mode CPE unit;

wherein the access system is further capable of being coupled to one or more circuit-mode CPE units and further comprising the steps of:

(f) converting each upstream circuit-mode signal received from a circuit-mode CPE unit into an upstream digital stream and transmitting the upstream digital stream to the circuit-switched network; and

(g) if a downstream digital stream received from the circuit interface is destined for a circuit-mode CPE unit, then converting the downstream digital stream into a downstream circuit-mode signal and transmitting the downstream circuit-mode signal to the circuit-mode CPE unit;

wherein the access system is further capable of being coupled to one or more combined circuit/packet-mode CPE units and further comprising the steps of:

(h) separating each upstream combined circuit/packet-mode signal received from a combined circuit/packet-mode CPE unit into an upstream packetized data signal and an upstream circuit-mode signal;

(i) transmitting the upstream packetized data signal to the packet-switched network;

(j) converting the upstream circuit-mode signal into an upstream digital stream and transmitting the upstream digital stream to the circuit-switched network;

(k) if a downstream packetized data signal received from the packet-switched network is destined for a combined circuit/packet-mode CPE unit, then combining the downstream packetized data signal with any corresponding downstream circuit-mode signal and transmitting the resulting downstream combined circuit/packet-mode signal to the combined circuit/packet-mode CPE unit; and

(l) if a downstream digital stream received from the circuit-switched network is destined for a combined circuit/packet-mode CPE unit, then converting the downstream digital stream into a downstream circuit-mode signal, combining the downstream circuit-mode signal with any

corresponding downstream packetized data signal, and transmitting the resulting downstream combined circuit/packet-mode signal to the combined circuit/packet-mode CPE unit.

24. (new) The method of claim 23, wherein the access system does not have individual dedicated resources for each local packet-mode CPE unit.

25. (new) The method of claim 23, wherein the access system dynamically allocates, in real time, system resources for each local packet-mode CPE unit.

26. (new) The method of claim 23, wherein:
the multi-services access system is a multi-services digital loop carrier (DLC) system;
the one or more circuit-mode CPE units are telephones;
the one or more local and remote packet-mode CPE units and the one or more combined circuit/packet CPE units are DSL CPE units;
the packetized derived signals comprise packetized derived voice signals;
the DLC system does not have individual dedicated resources for each local packet-mode CPE unit; and
the DLC system dynamically allocates, in real time, system resources for each local packet-mode CPE unit.

27. (new) The multi-services access system of claim 1, wherein both the packet-mode card and the packet interface are capable of distinguishing packetized data signals from packetized derived voice signals.